

## REMARKS

The Examiner's Office Action of July 2, 2004 has been received and its contents reviewed. Applicants would like to thank the Examiner for the consideration given to the above-identified application.

Claims 1-6 were pending prior to this Amendment. By this Amendment, new claims 7-9 have been added, and claims 3-5 have been amended. Accordingly, claims 1-9 are pending for consideration, of which claim 1 is independent. In view of the amendments presented above and of the following remarks, reconsideration of this application is now requested.

Referring now to the detailed Office Action, claim 5 stands rejected under 35 U.S.C. §112, second paragraph, as indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. The Examiner contends that the structure associated with the claim recitation is not understood in that the memory cell placement region is not precisely defined as the specification broadly defines this area as the area where the capacitor elements are generally placed. In response, Applicants have amended claim 5 to further clarify the memory cell placement region as a region in which the plurality of capacitor elements are placed.

In order to explain the features recited in claim 5, Applicants respectfully direct the Examiner's attention to page 15, line 23 through page 16, line 5, wherein the pattern density  $\gamma_2$  of contact plugs as a parameter is discussed. Further, page 7, lines 7-27 and page 15, lines 8-22 discuss the use of a dummy cell provided in peripheral region A (Fig. 2) and the value of a total area of the contact plugs to an area of the memory cell placement region. Applicants respectfully assert that, with the knowledge of these characteristics, for example, and memory devices in general, one of ordinary skill in the art would understand where the area of memory cell placement region would be.

Moreover, with respect to 35 U.S.C. §112, second paragraph rejection, MPEP §2173.02, relating to "Clarity and Precision", states:

*The essential inquiry pertaining to this requirement is whether the claims set out and circumscribe a particular subject matter with a reasonable degree of clarity and particularity. Definiteness of claim language must be analyzed, not in a vacuum, but in light of:*

- (A) The content of the particular application disclosure;*
- (B) The teachings of the prior art; and*

*(C) The claim interpretation that would be given by one possessing the ordinary level of skill in the pertinent art at the time the invention was made. In reviewing a claim for compliance with 35 U.S.C. 112, second paragraph, the examiner must consider the claim as a whole to determine whether the claim apprises one of ordinary skill in the art of its scope ...*

In view of the above, Applicants respectfully request reconsideration and withdrawal of the §112, second paragraph rejection of claim 5.

Claims 1-5 stand rejected under 35 U.S.C. §103(a) as unpatentable over Applicants' admitted prior art (hereafter AAPA) and further in view of Hwang et al. (U.S. Patent No. 6,323,132 – hereafter Hwang). It is noted that the Examiner did not reject claim 6, and, hence, it is presumed that claim 6 contains allowable subject matter. In response to the rejection, Applicants respectfully traverse the rejection of claims 1-5 at least for the reasons provided below.

Initially, as understood, the phrase "as applied to claims \*\*\*" set forth in the Office Action is a typographical error. Hence, Applicants cannot and will not respond to this phrase.

Before addressing the §103(a) rejection, Applicants would like to bring to the Examiner's attention the parent application of this pending application which has now issued as U.S. Patent No. 6,602,721 (hereafter the '721 patent). The '721 patent is directed to a method for fabricating ferroelectric memory device, while this instant child application is directed to a ferroelectric memory device.

Turning now to the present invention, the features of the present invention reside in that a distance from an arbitrary position on the upper surface of the lower electrode to a nearest end portion thereof is about 0.6  $\mu\text{m}$  or less and that each of the lower electrodes is buried in a burying insulating film to have an upper surface planarized relative to an upper surface of the burying film and having a plane configuration. The structure may positively utilize the erosion phenomenon generated during the CMP process.

The erosion phenomenon due to CMP enables the peripheral portion of the lower electrode to be graded off. When the lower electrode has the size shown in Figs. 6B and 6C, the center portion of the lower electrode, in addition to the peripheral portion thereof, is also polished. The center portion and the peripheral portion of the upper surface of the lower electrode has substantially the same height, and the roughness of the upper surface of the lower electrode is eliminated so as to increase the planarity thereof. According to the

structure, it is possible to form the capacitor insulating film without any variations and the upper electrode.

In contrast to the present invention, Hwang, the reference is related to etching methods for anisotropic platinum profile. More specifically, Hwang states the following in col. 8, lines 42-50:

*Each of the platinum electrodes includes a dimension having a value equal to or less than about 1.0  $\mu\text{m}$ , preferably equal to or less than about 0.6  $\mu\text{m}$ , preferably equal to or less than about 0.35  $\mu\text{m}$ , preferably equal to or less than about 0.3  $\mu\text{m}$ . More preferably, each of the platinum electrodes has a width [emphasis added] equal to or less than about 0.35  $\mu\text{m}$ , preferably equal to or less than about 0.3  $\mu\text{m}$ , a length [emphasis added] equal to or less than about 1.0  $\mu\text{m}$ , preferably equal to or less than about 0.6  $\mu\text{m}$ , and a height equal to or less than about 0.6  $\mu\text{m}$ .*

Applicants respectfully submit that Hwang does not appear to disclose or suggest each lower electrode having a plane configuration such that a distance from an arbitrary position on the upper surface of the lower electrode to the nearest end portion thereof is about 0.6  $\mu\text{m}$  or less as recited in claim 1 of the present invention. Applicants respectfully direct the Examiner's attention to Figs. 7A and 7B and their description on page 23, lines 7-14 and page 22, lines 9-21 for support and explanation of the aforementioned feature of claim 1.

Moreover, as stated by the Examiner in the second paragraph from the bottom of page 2 of the detailed Office Action, the electrode of the present invention "is sized so to have an effective width of less than 1.2 microns so that a distance from an arbitrary position on the upper surface of the lower electrode to the nearest end portion is equal to or less than 0.6 microns." However, as summarized above and as acknowledged by the Examiner, Hwang discloses a platinum electrode that includes a dimension having a value equal to or less than 1.0  $\mu\text{m}$ , which is different from the "effective width of 1.2 microns" stated by the Examiner.

Further, the width and length preferences of Hwang do not suggest "a plane configuration such that a distance from an arbitrary position on the upper surface of the lower electrode to the nearest end portion thereof is about 0.6  $\mu\text{m}$  or less" as recited in claim 1 of the present invention.

Still further, Hwang teaches the use of high density plasma of an etchant gas to etch the platinum electrode layer. Hwang fails to disclose forming a burying insulating film or

performing a planarizing step using CMP after the formation of the lower electrode. That is, there is no suggestion or motivation provided in Hwang to use Chemical-Mechanical Polishing (CMP) or the use of over-polishing. Applicants respectfully submit that Hwang and AAPA's Figs. 11A and 11B do not recognize the problem and solution related to CMP.

In AAPA, the recess is generated between the lower electrode 104 and the burying insulating film 105, as disclosed in Fig. 11A of the present application. Moreover, the peripheral portion of the lower electrode is graded off by over-polishing, and, as a result, the recess has a level difference between the center portion and the peripheral portion of the lower electrode.

Further, as disclosed on page 2, line 26 through page 5, line 10, Figs. 11A and 11B of AAPA have a first problem wherein when the burying insulating film 105, which is deposited to cover the plurality of lower electrodes 104, is polished by CMP, and part of the lower electrodes 104 or of a region to be formed with memory cells is left unpolished to form polishing residue - it is difficult to uniformly expose the lower electrodes 104 over the entire surface of the memory cell formation region.

Further, according to AAPA, a second problem in the device of the prior art is the rough upper surfaces of the plurality of lower electrodes 104. A third problem is that the lower electrodes 104 peel off from the burying insulating film 105. Finally, a fourth problem in the prior art device is that part of the lower electrodes 104 peels off or remains unpolished to form polishing residue when the lower electrodes 104 and the dummy electrodes 104a are planarized.

Without recognizing the problems solved by the presently claimed invention, and without using polishing, Hwang cannot possibly suggest or motivate modifying its teaching with AAPA to make each of the lower electrodes being buried in a burying insulating film to have an upper surface planarized relative to an upper surface of the burying insulating film and having a plane configuration such that a distance from an arbitrary position on the upper surface of the lower electrode to the nearest end portion thereof is about 0.6 m or less as recited in claim 1.

It is well settled that when combining the references in order to support a *prima facie* case of obviousness, the references must be considered in their entirety. It is further settled that the mere fact that the prior art may be modified to reflect features of the claimed

invention does not make the modification and hence the claimed invention obvious unless the desirability of such modification is suggested by the prior art itself (MPEP §2141). Moreover, the claimed invention cannot be used as an instruction manual or "template" to piece together the teachings of the prior art so that the claimed invention is rendered obvious, *In Re Fritsch*, 23 USPQ2d 1780 (Fed. Cir. 1992).

As AAPA and Hwang do not teach, disclose or suggest each of the lower electrodes being buried in a burying insulating film to have an upper surface planarized relative to an upper surface of the burying insulating film and having a plane configuration such that a distance from an arbitrary position on the upper surface of the lower electrode to the nearest end portion thereof is about 0.6  $\mu\text{m}$  or less, the combination of Applicants' cited prior art and Hwang is improper.

The presently claimed invention further distinguishes from AAPA and Hwang in claim 2, for example, by reciting a protective film formed on a side surface of the lower electrode. Applicants respectfully submit that the Examiner has not addressed this claimed feature.

In view of the amendments and arguments set forth above, Applicants respectfully request reconsideration and withdrawal of all pending rejections.

While the present application is now believed to be in condition for allowance, should the Examiner find some issue to remain unresolved, or should any new issues arise, which could be eliminated through discussions with Applicant's representative, then the Examiner is invited to contact the undersigned by telephone in order that the further prosecution of this application can thereby be expedited.

Respectfully submitted,



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